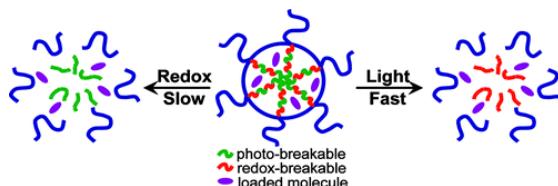


- Block Copolymer Micelles with a Dual-Stimuli-Responsive Core for Fast or Slow Degradation

Han, D.; Tong, X.; Zhao, Y. *Langmuir* **2012**, *28*, 2327-2331.

1

Abstract:

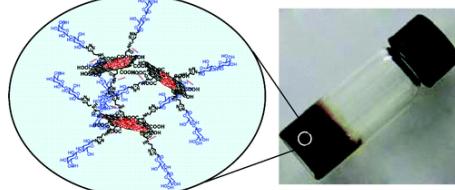


We report the design and demonstration of a dual-stimuli-responsive block copolymer (BCP) micelle with increased complexity and control. We have synthesized and studied a new amphiphilic ABA-type triblock copolymer whose hydrophobic middle block contains two types of stimuli-sensitive functionalities regularly and repeatedly positioned in the main chain. Using a two-step click chemistry approach, disulfide and *o*-nitrobenzyl methyl ester groups are inserted into the main chain, which react to reducing agents and light, respectively. With the end blocks being poly(ethylene oxide), micelles formed by this BCP possess a core that can be disintegrated either rapidly via photocleavage of *o*-nitrobenzyl methyl esters or slowly through cleavage of disulfide groups by a reducing agent in the micellar solution. This feature makes possible either burst release of an encapsulated hydrophobic species from disintegrated micelles by UV light, or slow release by the action of a reducing agent, or release with combined fast-slow rate profiles using the two stimuli.

- Supramolecular Self-Assembly Induced Graphene Oxide Based Hydrogels and Organogels

Cheng, Q.-Y.; Zhou, D.; Gao, Y.; Chen, Q.; Zhang, Z.; Han, B.-H. *Langmuir* **2012**, *28*, 3005-3010.

Abstract:

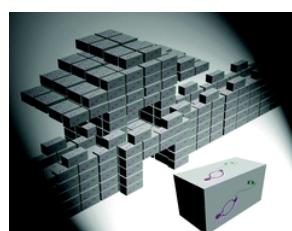


We demonstrate the construction of three-dimensional graphene oxide based gel networks through the self-assembly of a series of amphiphilic molecules, which possess a polar carbohydrate headgroup attached to a nonpolar pyrene group. The gelation process can occur in both aqueous and organic solutions and be influenced by the gelators' molecular structure. The driving forces for the gelation process were determined as  $\pi-\pi$  stacking and hydrogen bonding interaction by using fluorescence and infrared spectroscopies. Rheometry was used to investigate the mechanical properties of the hydrogels and the organogels. The hydrogel was investigated to be applied to remove dye from aqueous solution.

- Supramolecular polymers constructed by crown ether-based molecular recognition

Zheng, B.; Wang, F.; Dong, S.; Huang, F. *Chem. Soc. Rev.* **2012**, *41*, 1621-1636.

Abstract:



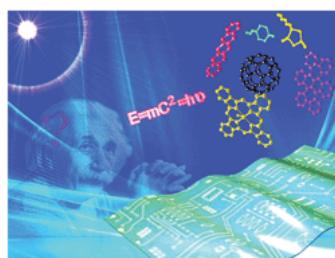
Supramolecular polymers, polymeric systems beyond the molecule, have attracted more and more attention from scientists due to their applications in various fields, including stimuli-responsive materials, healable materials, and drug delivery. Due to their good selectivity and convenient environmental responsiveness, crown ether-based molecular recognition motifs have been actively employed to fabricate supramolecular polymers with interesting properties and novel applications in recent years. In this *tutorial review*, we classify supramolecular polymers based on their differences in topology and cover recent advances in the marriage between crown ether-based molecular recognition and polymer science.

2

- Organic photoresponse materials and devices

Dong, H.; Zhu, H.; Meng, Q.; Gong, X.; Hu, W. *Chem. Soc. Rev.* **2012**, *41*, 1754-1808.

Abstract:

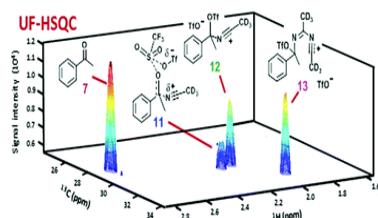


Organic photoresponse materials and devices are critically important to organic optoelectronics and energy crises. The activities of photoresponse in organic materials can be summarized in three effects, photoconductive, photovoltaic and optical memory effects. Correspondingly, devices based on the three effects can be divided into (i) photoconductive devices such as photodetectors, photoreceptors, photoswitches and phototransistors, (ii) photovoltaic devices such as organic solar cells, and (iii) optical data storage devices. It is expected that this systematic analysis of photoresponse materials and devices could be a guide for the better understanding of structure–property relationships of organic materials and provide key clues for the fabrication of high performance organic optoelectronic devices, the integration of them in circuits and the application of them in renewable green energy strategies (*critical review*, 452 references).

- Monitoring Mechanistic Details in the Synthesis of Pyrimidines via Real-Time, Ultrafast Multidimensional NMR Spectroscopy

Pardo, Z.-D.; Olsen, G.-L.; Fernández-Valle, M.-E.; Frydman, L.; Martínez-Álvarez, R.; Herrera, A. *J. Am. Chem. Soc.* **2012**, *134*, 2706-2715.

Abstract:



Recent years have witnessed unprecedented advances in the development of fast multidimensional NMR acquisition techniques. This progress could open valuable new opportunities for the elucidation of chemical and biochemical processes. This study demonstrates one such capability, with the first real-time Two-dimensional (2D) dynamic analysis of a complex organic reaction relying on unlabeled substrates. Implementing such measurements required the development of new ultrafast 2D

methods, capable of monitoring multiple spectral regions of interest as the reaction progressed. The alternate application of these acquisitions in an interleaved, excitation-optimized fashion, allowed us to extract new structural and dynamic insight concerning the reaction between aliphatic ketones and triflic anhydride in the presence of nitriles to yield alkylpyrimidines. Up to 2500 2D NMR data sets were thus collected over the course of this nearly 100 min long reaction, in an approach resembling that used in functional magnetic resonance imaging. With the aid of these new frequency-selective low-gradient strength experiments, supplemented by chemical shift calculations of the spectral coordinates observed in the 2D heteronuclear correlations, previously postulated intermediates involved in the alkylpyrimidine formation process could be confirmed, and hitherto undetected ones were revealed. The potential and limitations of the resulting methods are discussed.

- Intermolecular Ritter-Type C–H Amination of Unactivated  $sp^3$  Carbons  
Michaudel, Q.; Thevenet, D.; Baran, P. *J. Am. Chem. Soc.* **2012**, *134*, 2547–2550.

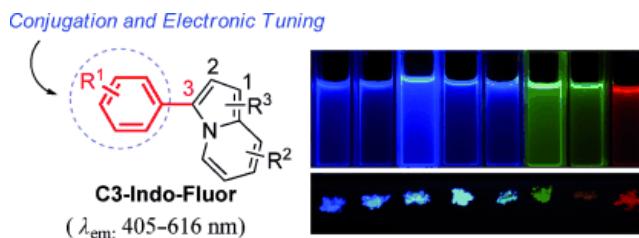
Abstract:



Intermolecular Ritter-type C–H amination of unactivated  $sp^3$  carbons has been developed. This new reaction proceeds under mild conditions using readily available reagents and an inexpensive source of nitrogen (acetonitrile). A broad scope of substrates can be aminated with this method since many functional groups are tolerated. This reaction also allows for the direct, innate C–H amination of a variety of hydrocarbons such as cyclohexane without the need of prefunctionalization or installation of a directing group.

- Discovery of a Full-Color-Tunable Fluorescent Core Framework through Direct CH (Hetero)arylation of N-Heterocycles  
Liu, B.; Wang, Z.; Wu, N.; Li, M.; You, J.; Lan, J. *Chem. Eur. J.* **2012**, *18*, 1599–1603.

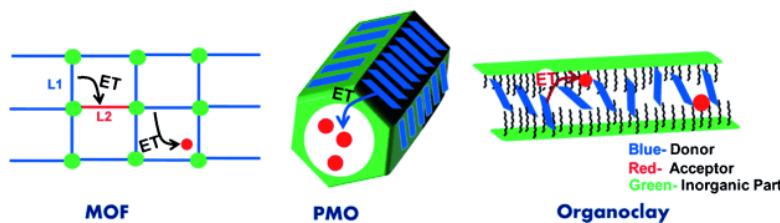
Abstract:



All the colors of the rainbow! A full coverage of emission wavelengths in the visible region (405–616 nm) with large Stokes shifts in C3-Indo-Fluor may be straightforwardly and succinctly achieved by the palladium-catalyzed direct CH arylation of indolizines at the C3 position of the pyrrole ring (see figure). The fluorophores have successfully marked A375 cells.

- Light-Harvesting Hybrid Assemblies  
Rao, K. V.; Datta, K. K. R.; Eswaramoorthy, M.; George, S. *J. Chem. Eur. J.* **2012**, *18*, 2184–2194.

Abstract:

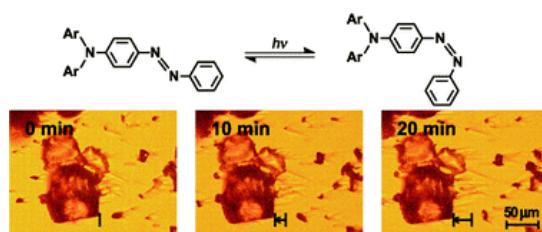


Light-harvesting hybrids have gained much importance as they are considered as potential mimics for photosynthetic systems. In this Concept article we introduce the design concepts involved in the building up of light-harvesting hybrids; these resemble the well-studied organic-based assemblies for energy transfer. We have structured this article into three parts based on the strategies adopted in the synthesis of hybrid assemblies, as covalent, semicovalent, and noncovalent procedures. Furthermore, the properties and structural features of the hybrids and analogous organic assemblies are compared. We also emphasize the challenges involved in the processability of these hybrid materials for device applications and present our views and results to address this issue through the design of soft-hybrids by a solution-state, noncovalent, self-assembly process.

- Photoinduced mass flow of photochromic molecular materials.

Hideyuki N.; Motoko S. *J. Mater. Chem.* **2012**, 22, 3702-3704.

Abstract:

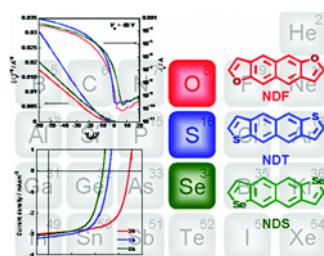


Relatively long-range mass flow at the surface level of amorphous films of azobenzene-based photochromic molecular materials was observed upon angled irradiation using a p-polarized laser beam. According to the same principle, the movement of the fragments of these molecular glasses could be induced by angled irradiation from their bottom.

- Naphtho[2,3-*b*:6,7-*b*']dichalcogenophenes: Syntheses, Characterizations, and Chalcogene Atom Effects on Organic Field-Effect Transistor and Organic Photovoltaic Devices.

Masahiro N.; Hiroki M.; Shoji S.; Kazuo T. *Chem. Mater.* **2012**, 24, 190-198.

Abstract:



New linear-shaped naphtho[2,3-*b*:6,7-*b*']-difurans (NDFs) and -selenophenes (NDSs) were synthesized selectively from 3,7-dibromo-2,6-dihydroxynaphthalene and evaluated as organic semiconductors in comparison to corresponding naphtho[2,3-*b*:6,7-*b*']dithiophenes (NDTs). Evaluation of the electronic structures of the parent compounds by means of electrochemical and optical measurements clearly indicated that NDT and NDS are quite similar to each other, whereas only NDF has a marked different electronic structure. Thin film devices, including organic field-effect

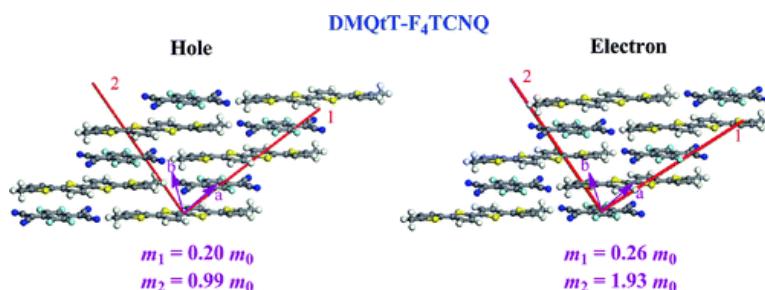
transistors (OFETs) and bilayer photovoltaics (OPVs) with  $C_{60}$  or  $C_{70}$  as an acceptor layer, were fabricated with the diphenyl derivatives using vacuum deposition. The thin films were found to be nicely crystalline with the edge-on molecular orientation both on Si/SiO<sub>2</sub> (for OFETs) and ITO substrates (for OPVs). The thin films acted as active semiconducting layer in OFETs with mobility higher than  $0.1 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$  and as a donor layer in OPVs with power conversion efficiencies of up to 2.0%, indicating that the present naphthodichalcogenophenes are potential core structures for the development of new organic semiconductors.

5

- Prediction of Remarkable Ambipolar Charge-Transport Characteristics in Organic Mixed-Stack Charge-Transfer Crystals

Zhu, L.; Yi, Y.; Li, Y.; Kim, E.-G.; Coropceanu, V.; Brédas, J.-L. *J. Am. Chem. Soc.* **2012**, *134*, 2340–2347.

Abstract:

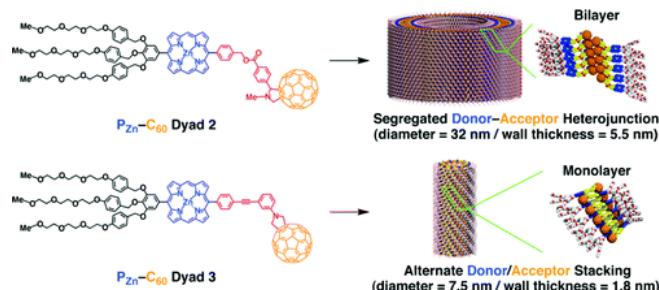


We have used density functional theory calculations and mixed quantum/classical dynamics simulations to study the electronic structure and charge-transport properties of three representative mixed-stack charge-transfer crystals, DBTTF-TCNQ, DMQtT-F<sub>4</sub>TCNQ, and STB-F<sub>4</sub>TCNQ. The compounds are characterized by very small effective masses and modest electron–phonon couplings for both holes and electrons. The hole and electron transport characteristics are found to be very similar along the stacking directions; for example, in the DMQtT-F<sub>4</sub>TCNQ crystal, the hole and electron effective masses are as small as 0.20 and 0.26  $m_0$ , respectively. This similarity arises from the fact that the electronic couplings of both hole and electron are controlled by the same super exchange mechanism. Remarkable ambipolar charge-transport properties are predicted for all three crystals. Our calculations thus provide strong indications that mixed-stack donor–acceptor materials represent a class of systems with high potential in organic electronics.

- Segregated and Alternately Stacked Donor/Acceptor Nano domains in Tubular Morphology Tailored with Zinc Porphyrin–C<sub>60</sub>Amphiphilic Dyads : clear Geometrical Effects on Photoconduction.

Charvet, R.; Yamamoto, Y.; Sasaki, T.; Kim, J.; Kato, K.; Takata, M.; Saeki, A.; Seki, S.; Aida, T. *J. Am. Chem. Soc.* **2012**, *134*, 2524–2527.

Abstract:

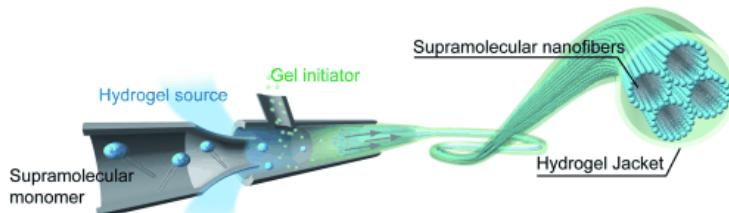


Amphiphilic zinc porphyrin ( $P_{Zn}$ ; electrondonor, D)–fullerene ( $C_{60}$ ; electron acceptor, A) dyads **2** and **3**, bearing an identical hydrophilic wedge with triethylene glycol chains but different linkers between the  $P_{Zn}$  and  $C_{60}$  units, self-assemble into nanotubes with essentially different dimensional and geometrical features from one another. The nanotube from dyad **2** with an ester linker consists of a bilayer wall formed with coaxially segregated D and A nano domains along the tube axis (coaxial D–A hetero junction), thereby displaying explicit photoconductivity with ambipolar carrier transport properties. In contrast, the nanotube from dyad **3** with a rigid acetylene linker consists of a monolayer wall with an alternate geometry of D/A stacking, resulting in poor photo conducting outputs. Such a geometrical difference also significantly affects the photovoltaic properties.

6

- Meter-Long and Robust Supramolecular Strands Encapsulated in Hydrogel Jackets  
Kiriya, D.; Ikeda, M.; Onoe, H.; Takinoue, M.; Komatsu, H.; Shimoyama, Y.; Hamachi, I.; Takeuchi, S. *Angew. Chem. Int. Ed.* **2012**, *51*, 1553–1557.

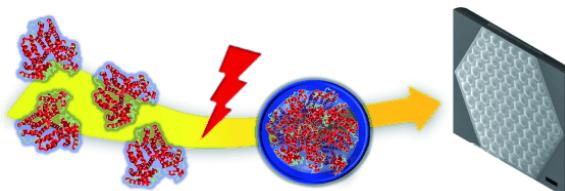
Abstract:



Jacketed supramolecular strand: Meter-long supramolecular strands were obtained by encapsulating them in polymer gels using a microfluidic channel (see picture). The nanofibers in the strands are self-assembled and aligned under the laminar flow conditions. Their mechanical strength was sufficiently high to allow their patterning onto a substrate and use them as a template for synthesizing an insoluble, conductive polymer.

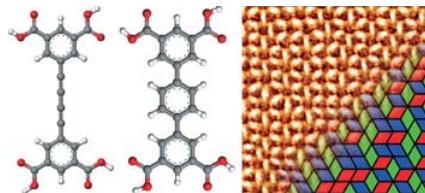
- Dynamically Tunable Protein Microlenses  
Sun, Y. L.; Dong, W. F.; Yang, R. Z.; Meng, X.; Zhang, L.; Chen, Q. D.; Sun, H. B. *Angew. Chem., Int. Ed.* **2012**, *51*, 1558–1562.

Abstract:



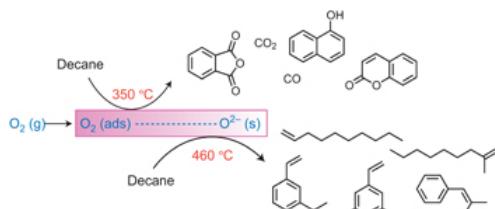
Proteins in focus: Dynamically tunable protein microdevices were built up by a simple “top-down”, maskless, femtosecond laser direct writing approach with bovine serum albumin. This technique was used to produce biocompatible microlenses that swell and shrink reversibly in response to changes in the pH of the surrounding solution. These responses to environmental stimuli can be used to focus the microlenses.

- Broken symmetry and the variation of critical properties in the phase behaviour of supramolecular rhombus tilings  
Stannard, A.; Russell, J. C.; Blunt, M. O.; Salesiotis, C.; Giménez-López, M. C.; Taleb, N.; Schröder, M.; Champness, N. R.; Garrahan, J. P.; Beton, P. H. *Nat. Chem.* **2012**, *4*, 112–117.

Abstract:

The tiling of surfaces has long attracted the attention of scientists, not only because it is intriguing intrinsically, but also as a way to control the properties of surfaces. However, although random tiling networks are studied increasingly, their degree of randomness (or partial order) has remained notoriously difficult to control, in common with other supramolecular systems. Here we show that the random organization of a two-dimensional supramolecular array of isophthalate tetracarboxylic acids varies with subtle chemical changes in the system. We quantify this variation using an order parameter and reveal a phase behaviour that is consistent with long-standing theoretical studies on random tiling. The balance between order and randomness is driven by small differences in intermolecular interaction energies, which can be related by numerical simulations to the experimentally measured order parameter. Significant variations occur with very small energy differences, which highlights the delicate balance between entropic and energetic effects in complex self-assembly processes.

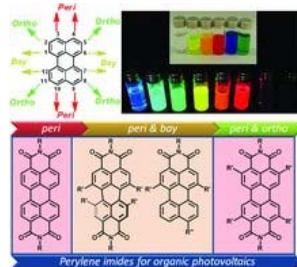
- Non-lattice surface oxygen species implicated in the catalytic partial oxidation of decane to oxygenated aromatics  
Pradhan, S.; Bartley, J. K.; Bethell, D.; Carley, A. F.; Conte, M.; Golunski, S.; House, M. P.; Jenkins, R. L.; Lloyd, R.; Hutchings G. J. *Nat. Chem.* **2012**, 4, 134–139.

Abstract:

The one-step transformation of C<sub>7</sub>–C<sub>12</sub> linear alkanes into more valuable oxygenates provides heterogeneous catalysis with a major challenge. In evaluating the potential of a classic mixed-metal-oxide catalyst, we demonstrate new insights into the reactivity of adsorbed oxygen species. During the aerobic gas-phase conversion of *n*-decane over iron molybdate, the product distribution correlates with the condition of the catalyst. Selectivity to oxygenated aromatics peaks at 350 °C while the catalyst is in a fully oxidized state, whereas decene and aromatic hydrocarbons dominate at higher temperatures. The high-temperature performance is consistent with an underlying redox mechanism in which lattice oxide ions abstract hydrogen from decane. At lower temperatures, the formation of oxygenated aromatics competes with the formation of CO<sub>2</sub>, implying that electrophilic adsorbed oxygen is involved in both reactions. We suggest, therefore, that so-called non-selective oxygen is capable of insertion into carbon-rich surface intermediates to generate aromatic partial oxidation products.

- Perylene Imides for Organic Photovoltaics: Yesterday, Today, and Tomorrow  
Li, C.; Wonneberger, H. *Adv. Mat.* **2012**, 24, 613–636.

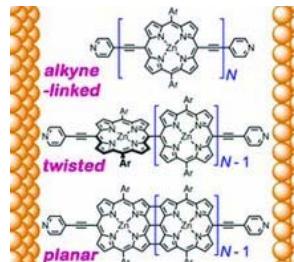
Abstract :



Perylene imides have been an object of research for 100 years and their derivatives are key n-type semiconductors in the field of organic electronics. While perylene diimides have been applied in many electronic and photonic devices, their use can be traced back to the first efficient organic solar cell. By functionalizing different positions of the in total 12 positions (four *peri*, four *bay*, and four *ortho*-positions) on the perylene core, perylene imides with significantly different optical, electronic and morphological properties may be prepared. Perylene imides and their derivatives have been used in several types of organic photovoltaics, including flat-, and bulk-heterojunction devices as well as dye-sensitized solar cells. Additionally perylene imides-based copolymers or oligomers play an important role in single junction devices. In this review, the relationship between the photovoltaic performance and the structure of perylene imides is discussed.

- Comparison of the Conductance of Three Types of Porphyrin-Based Molecular Wires :  $\beta, \text{meso}, \beta$ -Fused Tapes, *meso*-Butadiyne-Linked and Twisted *meso-meso* Linked Oligomers  
Sedghi, G.; Esdaile, L.-J.; Anderson, H.-L.; Martin, S.; Bethell, D.; Higgins, S.-J.; Nichols, R.-J.  
*Adv. Mat.* **2012**, 24, 653-657.

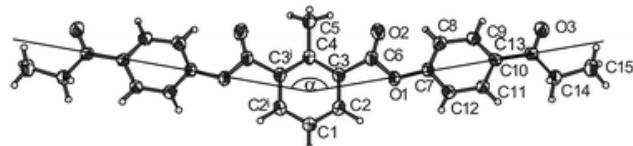
Abstract :



The length dependence of charge transport is evaluated in three families of porphyrin-based wires. Planar edge-fused tapes and alkyne-linked oligomers mediate efficient charge transport with exceptionally shallow distance dependence, whereas the conductances of the twisted singly linked chains decrease steeply with increasing oligomer length. The planar tapes are more conjugated than the alkyne-linked oligomers, but these two types of wires have similar conductance attenuation factors.

- Unexpected liquid crystalline behaviour of three-ring bent-core mesogens: bis(4-subst.-phenyl) 2-methyl-iso-phthalates  
Weissflog, W.; Baumeister, U.; Tamba, M.-G.; Pelzl, G.; Kresse, H.; Friedemann, R.; Hempel, G.; Kurz, R.; Roos, M.; Merzweiler, K.; Jákli, A.; Zhang, C.; Diorio, N.; Stannarius , R.; Eremin A.; Kornek, U. *Soft Matter*, **2012**, 8, 2671-2685.

Abstract:

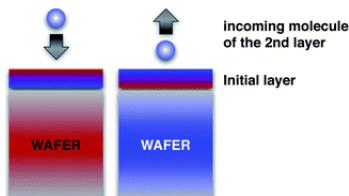


Three-ring bent-core bis(4-subst.-phenyl) 2-methyl-iso-phthalates exhibiting nematic, SmA and SmC phases are reported. The occurring mesophases have been identified by their optical textures and X-ray diffraction measurements which give also geometrical structural parameters like layer spacing and molecular tilt. Quantum chemical calculations on single molecules and X-ray structure analysis in the crystalline state indicate wide opening angles (about 155°) of the molecular legs due to the lateral methyl group in position 2 of the central phenyl ring. However solid state NMR spectroscopy in the liquid crystalline phases finds stronger molecular bending (bending angle to be about 138° in the SmA and about 146° in the nematic phase). Dielectric and SHG measurements give evidence that in the SmA phase a polar structure can be induced by application of an electric field which disappears in the isotropic liquid phase. The electric field not only leads to a slight textural change even in the SmA phase but also polar-type electric current response ( $P_s$  about 200 nC cm<sup>-2</sup>) is observed. This unusual electro-optical behaviour is discussed on the basis of the orientation of polar clusters formed by the bent molecules. In the paper we not only attempt to characterize the mesophases and to describe their physical properties, but we also show that these types of molecules represent the borderline between bent-shaped and calamitic liquid crystals.

- Slow and remanent electric polarization of adsorbed BSA layer evidenced by neutron reflection

Koutsioubas , A.; Lairez, D.; Zalczer G.; Cousin, F. *Soft Matter*, **2012**, 8, 2638-2643.

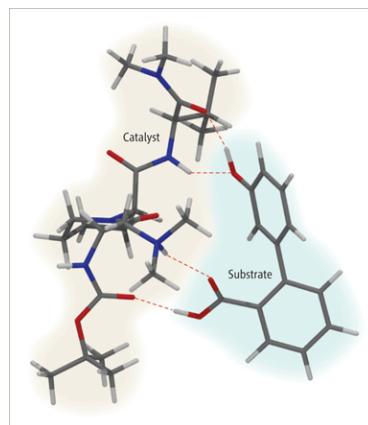
Abstract:



Using neutron reflectivity together with an appropriate electrochemical cell, we have studied the effects of transverse electric field on the bovine serum albumin (BSA) monolayer initially adsorbed at the interface of the aqueous solution and a conductive doped-silicon wafer. Depending on the sign of the initial potential, a second layer is adsorbed, or not, on top of the first whereas a subsequent reversal of potential has no effect. We show that this behaviour reveals the slow and remanent electric polarization of the first BSA layer. Based on the permanent dipolar structure of BSA, we suggest an analogy with dipolar glasses that may account for the slowness and memory of the process.

- Probing Frozen Molecular Embraces
- Zwier, T. S. *Science* **2012**, 335, 668-669.

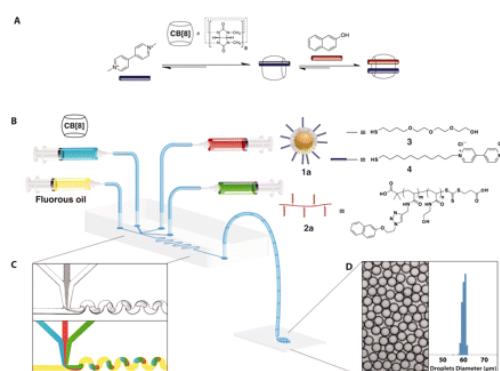
Abstract:



The interaction of a catalyst with its substrate partner can coax the reactant into a new conformation that can stretch its bonds and rotate its functional groups. These changes can reduce the energetic costs of reaction and facilitate a specific approach for other reactants that favors a particular stereochemical product. Some of the new catalysts being developed demonstrate exquisite control even over the way that bulky substituents are assembled on a framework by trapping them in a stereochemical configuration from which they cannot be disengaged, thus avoiding unwanted rearrangements. Some of these catalysts clasp onto one of the reactants through multiple hydrogen-bonding (H-bonding) attachment points that complement those on the substrate, working cooperatively to produce the desired configuration in the binding partner. On page 694 of this issue, Garand *et al.* submit a complex formed by a peptide-derived catalyst (C) and an aromatic substrate (S) (see the figure) to a detailed structural interrogation through a combination of mass spectrometry and infrared (IR) spectroscopy.

- One-Step Fabrication of Supramolecular Microcapsules from Microfluidic Droplets  
Zhang, J.; Coulston, R. J.; Jones, S. T.; Geng, J.; Scherman, O. A.; Abell, C. *Science* **2012**, *335*, 690-694.

Abstract:



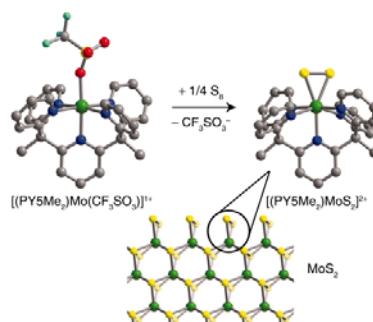
Although many techniques exist for preparing microcapsules, it is still challenging to fabricate them in an efficient and scalable process without compromising functionality and encapsulation efficiency. We demonstrated a simple one-step approach that exploits a versatile host-guest system and uses microfluidic droplets to generate porous microcapsules with easily customizable functionality. The capsules comprise a polymer-gold nanoparticle composite held together by cucurbit[8]uril ternary complexes. The dynamic yet highly stable micrometer-sized structures can be loaded in one step during capsule formation and are amenable to on-demand encapsulant release. The internal chemical environment can be probed with surface enhanced Raman spectroscopy.

- A Molecular MoS<sub>2</sub> Edge Site Mimic for Catalytic Hydrogen Generation

Karunadasa, H. I.; Montalvo, E.; Sun, Y.; Majda, M.; Long, J. R.; Chang, C. J. *Science* **2012**, *335*, 698-702.

11

Abstract:

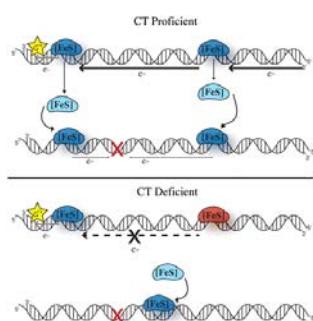


Inorganic solids are an important class of catalysts that often derive their activity from sparse active sites that are structurally distinct from the inactive bulk. Rationally optimizing activity is therefore beholden to the challenges in studying these active sites in molecular detail. Here, we report a molecule that mimics the structure of the proposed triangular active edge site fragments of molybdenum disulfide (MoS<sub>2</sub>), a widely used industrial catalyst that has shown promise as a low-cost alternative to platinum for electrocatalytic hydrogen production. By leveraging the robust coordination environment of a pentapyridyl ligand, we synthesized and structurally characterized a well-defined Mo<sup>IV</sup>-disulfide complex that, upon electrochemical reduction, can catalytically generate hydrogen from acidic organic media as well as from acidic water.

- DNA charge transport as a first step in coordinating the detection of lesions by repair proteins.

Sontz, P. A.; Mui, T. P.; Fuss, J. O.; Tainer, J. A.; Barton, J. K. *Proc. Natl. Acad. Sci. U. S. A.* **2012**, *109*, 1856-1861.

Abstract:



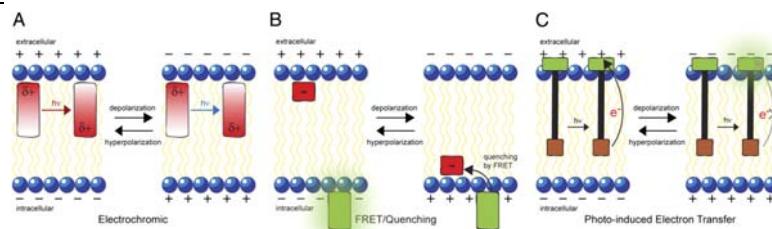
Damaged bases in DNA are known to lead to errors in replication and transcription, compromising the integrity of the genome. We have proposed a model where repair proteins containing redox-active [4Fe-4S] clusters utilize DNA charge transport (CT) as a first step in finding lesions. In this model, the population of sites to search is reduced by a localization of protein in the vicinity of lesions. Here, we examine this model using single-molecule atomic force microscopy (AFM). XPD, a 5'-3' helicase involved in nucleotide excision repair, contains a [4Fe-4S] cluster and exhibits a DNA-bound redox potential that is physiologically relevant. In AFM studies, we observe the redistribution of XPD onto kilobase DNA strands containing a single base mismatch, which is not a specific substrate for XPD but, like a lesion, inhibits CT. We further provide evidence for DNA-mediated signaling between XPD and Endonuclease III (EndoIII), a base excision repair glycosylase that also contains a

[4Fe-4S] cluster. When XPD and EndoIII are mixed together, they coordinate in relocating onto the mismatched strand. However, when a CT-deficient mutant of either repair protein is combined with the CT-proficient repair partner, no relocation occurs. These data not only indicate a general link between the ability of a repair protein to carry out DNA CT and its ability to redistribute onto DNA strands near lesions but also provide evidence for coordinated DNA CT between different repair proteins in their search for damage in the genome.

- Optically monitoring voltage in neurons by photo-induced electron transfer through molecular wires.

Miller, E. W.; Lin, J. Y.; Frady, E. P.; Steinbach, P. A.; Kristan, W. B.; Tsien, R. Y. *Proc. Natl. Acad. Sci. U. S. A.* **2012**, *109*, 2114-2119.

Abstract:

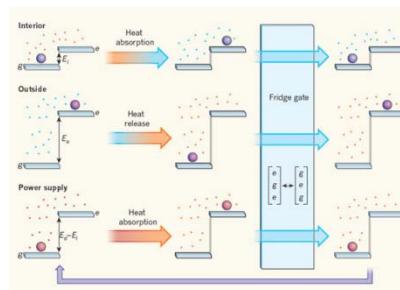


Fluorescence imaging is an attractive method for monitoring neuronal activity. A key challenge for optically monitoring voltage is development of sensors that can give large and fast responses to changes in transmembrane potential. We now present fluorescent sensors that detect voltage changes in neurons by modulation of photo-induced electron transfer (PeT) from an electron donor through a synthetic molecular wire to a fluorophore. These dyes give bigger responses to voltage than electrochromic dyes, yet have much faster kinetics and much less added capacitance than existing sensors based on hydrophobic anions or voltage-sensitive ion channels. These features enable single-trial detection of synaptic and action potentials in cultured hippocampal neurons and intact leech ganglia. Voltage-dependent PeT should be amenable to much further optimization, but the existing probes are already valuable indicators of neuronal activity.

- Thermodynamics: The fridge gate.

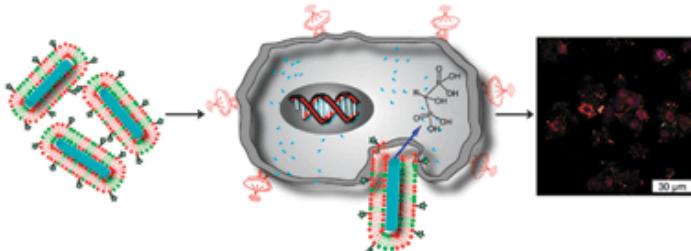
Renner, R. *Nature* **2012**, *482*, 164-165.

Abstract:



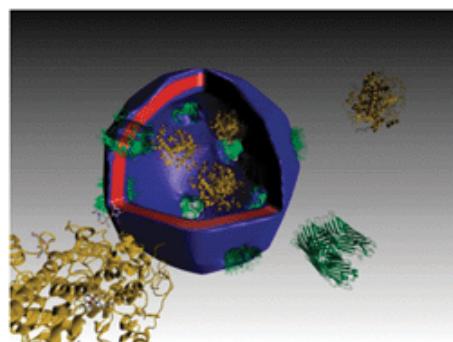
Minimalism is a popular trend in design, striving to expose the essence of an object through the elimination of all non-essential parts. Writing in the *Journal of Physics A*, Skrzypczyk *et al.*<sup>1</sup> have now applied this approach to the study of thermal machines such as heat engines and refrigerators. Reducing the complexity of a refrigerator to its extreme, they arrived at a device as simple as a single logic gate. What's more, this minimalist fridge works at optimal efficiency.

- Coercing bisphosphonates to kill cancer cells with nanoscale coordination polymers  
Liu, D.; Kramer, S. A.; Huxford-Phillips, R. C.; Wang, S.; Della Rocca, J.; Lin, W. *Chem. Commun.* **2012**, 48, 2668-2670.

Abstract:

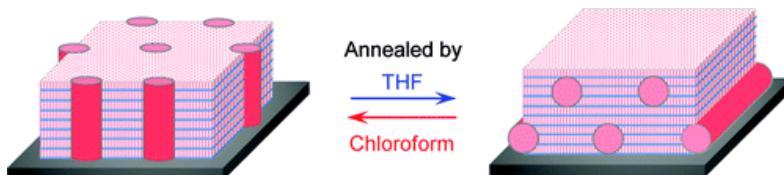
Nanoscale coordination polymers containing exceptionally high loadings of bisphosphonates were coated with single lipid bilayers to control the drug release kinetics and functionalized with a targeting ligand to endow cell-targeting capability, leading to much enhanced cytotoxicity against human lung and pancreatic cancer cells.

- Biological-like vesicular structures self-assembled from DNA-block copolymers  
Cottenye, N.; Syga, M.-I.; Nosov, S.; Müller, A. H. E.; Ploux, L.; Vebert-Nardin, C. *Chem. Commun.* **2012**, 48, 2615-2617.

Abstract:

The polymer modification of short nucleotide sequences has been achieved for future use as self-assembled biologically active structures with sizes in the nanometre range. Co-assembly of the resulting DNA-based amphiphilic block copolymers with native proteins demonstrates the self-assembly of biological-like vesicular structures.

- Effects of Annealing Solvents on the Morphology of Block Copolymer-Based Supramolecular Thin Films  
Huang, W-H.; Chen, P-Y.; Tung, S-H. *Macromolecules* **2012**, 45, 1562–1569.

Abstract:

We report a strategy that combines supramolecular assembly and solvent annealing to manipulate the microdomain orientation in block copolymer thin films. In supramolecular thin films formed by polystyrene-*b*-poly(4-vinylpyridine) (PS-*b*-P4VP) with 3-pentadecylphenol (PDP) hydrogen-bonded

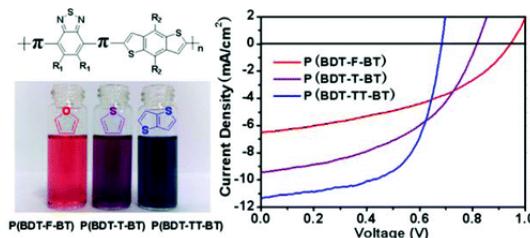
onto P4VP blocks, where PS blocks phase-separate into cylindrical microdomains, we found that the orientation of PS cylinders can be controlled by using different types of solvents to anneal the films. As films are annealed under the vapors of solvents bearing no oxygen atoms, such as chloroform, PS cylinders are perpendicular to the surface, while under those of solvents bearing oxygen, such as THF, PS cylinders are parallel to the surface. Furthermore, the orientation is switchable upon the alternate use of different types of solvents. The  $^1\text{H}$  NMR measurements showed that the strengths of hydrogen bonds between PDP and P4VP are greatly weakened in oxygen-bearing solvents due to the competition of the highly electronegative oxygen atoms. We thus suggest that the binding capability of PDP onto P4VP is the key to determine whether the supramolecules can be assembled in the vapors of different types of solvents, which in turn, regulates the orientation of PS cylinders.

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- Effects of  $\pi$ -Conjugated Bridges on Photovoltaic Properties of Donor- $\pi$ -Acceptor Conjugated Copolymers

Wang, X.; Sun, Y.; Chen, S.; Guo, X.; Zhang, M.; Li, X.; Li, Y.; Wang, H. *Macromolecules* **2012**, *45*, 1208–1216.

Abstract:



A series of conjugated donor (D)- $\pi$ -acceptor (A) copolymers, P(BDT-F-BT), P(BDT-T-BT), and P(BDT-TT-BT), based on benzodithiophene (BDT) donor unit and benzothiadiazole (BT) acceptor unit with different  $\pi$ -bridges, were designed and synthesized via a Pd-catalyzed Stille-coupling method. The  $\pi$ -bridges between the BDT donor unit and BT acceptor unit are furan (F) in P(BDT-F-BT), thiophene (T) in P(BDT-T-BT) and thieno[3,2-b]thiophene (TT) in P(BDT-TT-BT). It was found that the  $\pi$ -bridges significantly affect the molecular architecture and optoelectronic properties of the copolymers. With the  $\pi$ -bridge varied from furan to thiophene, then to thieno[3,2-b]thiophene, the shape of the molecular chains changed from z-shaped to almost straight line gradually. Band gaps of P(BDT-F-BT), P(BDT-T-BT) and P(BDT-TT-BT) were tuned from 1.96 to 1.82 to 1.78 eV with HOMO levels up-shifted from -5.44 to -5.35 to -5.21 eV, respectively. Bulk heterojunction solar cells with the polymers as donor and PC71BM as acceptor demonstrated power conversion efficiency varied from 2.81% for P(BDT-F-BT) to 3.72% for P(BDT-T-BT) and to 4.93% for P(BDT-TT-BT). Compared to furan and thiophene, thieno[3,2-b]thiophene  $\pi$ -bridge in the copolymers shows superior photovoltaic performance. The results indicate that the photovoltaic performance of some high efficiency D-A copolymers reported in literatures could be improved further by inserting suitable  $\pi$ -bridges.